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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/917,363	07/27/2001	Matthew M. Johnston	S01.12-0734/STL 9752	9874

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EXAMINER	
GARBER, CHARLES D	

ART UNIT	PAPER NUMBER
2856	

DATE MAILED: 10/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/917,363	JOHNSTON, MATTHEW M.	
	Examiner	Art Unit	
	Charles Garber	2856	

-- The MAILING DATE of this communication appears n the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *9-19 and 21-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11,14,16-19,21,22,25,27 and 28* is/are rejected.

7)☒ Claim(s) *12,15,23,24 and 26* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 9/11/2003 have been fully considered but they are not persuasive.

Regarding applicant's argument with respect to claim 17 against Examiner's rejection on the basis of 35 USC § 112, First Paragraph, Applicant bases the argument on the assertion that Casimir forces are dependent on shape of the surface as well as distance between the surfaces. Applicant, in response to the rejection specifically recites "if the separation distance between the surfaces is maintained constant **and the shape of at least one surface changes**, the Casimir force exerted between the surfaces changes" [emphasis added by Examiner]. However, Examiner notes the specification only gives support to the Casimir forces being dependent upon the area of only the smaller surface (specification page 6 line 5) which is used to derive an equation relating the shape of a probe surface to the force exerted on it from a nominal surface (equation 3 in the specification) wherein the probe shape is spherical. The equation does not include any parameters related to the shape of the nominal surface being measured. Because the shape of the probe does not change the measured forces will only be related to changes in the distance from the surface, not the shape of any surface.

Claim Rejections - 35 USC § 112

Claim 17 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter that was not

described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 17 includes the step of holding the probe at a constant separation during measurement, which will also maintain the probe at a constant van der Waal or Casimir force level; the process then repeats this operation for a plurality of points. However, the claim then includes the step of comparing forces at the plural points to determine a defect. This is not possible as all the forces will be the same. For purposes of further examination Examiner will assume the device is continuing in a constant height mode but is comparing probe movement (required to maintain the constant height above the surface) to determine a defect.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 9-11, 14, 17, 18, 21, 22, 25 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Martin et al. (US Patent 5,283,442) in view of Takahashi et al. (US Patent 6,537,648).

Regarding claim 9, Martin discloses a method and apparatus for surface profiling using an atomic force microscope (AFM) which is equivalent to determining the degree to which the shape of a first surface varies from a nominal shape. Martin discloses the holding the probe and moving the probe so as to maintain a constant tunneling current or constant deflection which maintains a constant force and hence a constant distance from the surface (column 4 lines 3-21) The Martin reference further incorporates by reference US Patent 4,724,318 which discloses the probe is initially brought into a position "to within a preselected distance, i.e., about 0.3 nm". Bringing the probe tip to within a preselected distance then moving the probe tip so as to maintain the same force is considered equivalent to holding the first surface (probe tip) a known separation distance from a second surface (measured surface). Martin and the incorporated reference show probe tips that are either flat or sharp and are thus having a known shape.

Martin however discloses using measured deflections in terms of voltages or tunnel current rather than measured force values to compare/determine changes from the initial or nominal value required to control the probe tip at a constant distance. However, as the voltages or currents are proportional to force values and because Applicant has not disclosed that the force values is used for any purpose other than to control the second (probe) surface Examiner considers the reference voltage values to

be substantively equivalent to force values. Examiner in fact considers the equating of probe deflection or tunneling current measured values to force value to be standard practice in the art of atomic force microscopy.

Further, Martin does not disclose the force is a result of Casimir forces. However, Examiner considers the forces acting on the Martin probe and the effects being sensed to inherently be the result of Casimir forces. Edwards et al. in US Patent 6,094,971 explains that an AFM scanning tip within a distance of tens of nanometers may interact with the scanned surface by the action of Casimir forces (column 7 lines 54-64). As the probe tip of Martin is acting within this distance the tip is considered to be inherently reacting to Casimir forces.

Finally, Martin does not expressly disclose the measured surface is an electrically conductive surface.

Takahashi teaches a method of producing a substrate for an information recording medium (e.g. a magnetic disk) including measuring surface variation in terms of flatness, waviness, microwaviness and finally roughness. (title, background and figure 1) The magnetic disk is equivalent to a first electrically conductive surface and roughness is shown measured from a nominal wavy surface as illustrated at the bottom of figure 1 using an atomic force microscope (AFM).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to scan a conductive magnetic surface of a disk in order to determine its roughness and ensure that only disks with minimum roughness are used in order to reduce glide height and permit greater recording density.

As for claim 10, as discussed above Takahashi teaches the measured surface is a surface of a disc (disk) employed in a disc (disk) drive. It would have been obvious to one having ordinary skill in the art at the time the invention was made to scan a conductive magnetic surface of a disk in a disk drive to the same reasons given above.

As for claim 11, Martin discloses the first or probe 10 has a flat surface (see figures 1, 2 and 4B) parallel to the x-y plane of travel. Takahashi teaches the second or measured disk surface is nominally flat which is an advantageous feature in drive disks as discussed above and will be disposed substantially parallel to the AFM probe surface. Martin however does not expressly measure "attractive" Casimir forces between the first and second surfaces as in the instant invention.

Examiner considers that when the probe is moved close to the sample surface in an AFM device, a van der Waals or Casimir attractive force inherently acts between an atom at the tip of the probe and an atom on the sample surface. Only if the atoms move close to each other so as to nearly contact, do repulsive forces occur therebetween due to the Pauli exclusion principle. These principles are widely known in the art of AFM and Examiner takes Official Notice that it is widely known to operate AFM devices in either or both attractive and repulsive modes. It would have been obvious to one having ordinary skill in the art at the time the invention was made to operate an AFM device in attractive or repulsive modes balancing benefits of higher resolution from close contact with faster scanning and less risk of damaging the surface with further scanning distances.

As for claim 14, Takahashi further teaches determining average as well as maximum waviness, microwaviness or roughness as measured by AFM contactless laser interference techniques and further ensuring the maximum microwaviness amount is less than a threshold defined as the height of a head slider or reproducing head (column 2 line 22 to column 5 line 67 particularly column 5 lines 64-67). This requirement implies that maximum values less than the head are pass and that maximum values greater than the head height fail. It would have been obvious to one having ordinary skill in the art at the time the invention was made to ensure only disks with surface variations less than a threshold amount should pass so the disk will not interfere with and damage a disk drive read head in a finished drive device.

As for claim 17, as discussed above Takahashi advantageously taught testing a magnetic disk surface with an atomic force measuring device - a magnetic disk in a disk drive is a rotating disk. In doing so, Takahashi teaches measuring the surface profile which are measurements at a plurality of locations. Takahashi further teaches the maximum microwaviness (discussed above as a criteria for pass/fail) is the 95 percentile value of all the microwaviness values. This value is determined by extracting the 95 percentile point from a histogram of all microwaviness values. Examiner considers inherent in this process comparing each microwaviness value to each other microwaviness value in order to derive the appropriately ordered histogram.

Regarding claim 18, the references as discussed above with respect to claim 9 disclosed or suggested a method and apparatus for determining the degree to which the shape of a first electrically conductive surface varies from a nominal shape and

including an electrically conductive test surface (disk of Takahashi) having a known shape (nominally flat) and a force gauge (probe 10 and cantilever 12 of Martin) that measures the force exerted between the first surface and the test surface to obtain a measured exerted force value. Martin also discloses a computer 32 which is a processor which performs the functions of the instant invention as discussed above with respect to claim 9 above. Though the references do not expressly include a grasping member that holds the first surface (probe) a known distance from the test surface all atomic force microscope devices inherently include some sort of supporting member to hold the cantilever and probe at a given distance from the sample surface, therefore a grasping member is considered to be inherent in the references.

Claim 21 is substantively the same as claim 10 as discussed above.

Claim 22 is substantively the same as claim 11 as discussed above.

Claim 25 is substantively the same as claim 14 as discussed above.

Claim 28 is substantively the same as claim 17 as discussed above.

Claims 16, 19, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Martin et al. (US Patent 5,283,442) as modified by Takahashi et al. (US Patent 6,537,648) and applied to claim 9 above and further in view of Edwards et al. (US Patent 6,094,971).

Regarding claim 16, as shown in the figures Martin discloses probe 10 which is a first object with a first surface on the bottom of the probe (which is a side of the probe) and substrate 20 which is a second object with a second surface on the top of the substrate (which is a side of the substrate). However Martin discloses measuring

displacement (which is equivalent to force as discussed above) using a laser inerferometer 24 rather than a piezoelectric transducer affixed to one of the object sides as in the instant invention.

Edwards teaches using a quartz tuning fork 2 (which is a piezoelectric device) coupled to a side of a probe tip 6 to measure Casimir force effects in a scanning probe microscope (see figure 2A and column 6 lines 15-26, column 7 liens 32-64).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a piezoelectric device to detect normal tip-sample interactions as a preferred alternative to optical means when samples are light sensitive (title and column 2 lines 1-27).

Claims 19 and 27 are substantively the same as claims 16 and 18 as discussed above.

Allowable Subject Matter

Claims 12, 13, 15, 23, 24, 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Please see Examiner's earlier Office Action for reasons for allowance.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles Garber whose telephone number is (703) 308-6062. The examiner can normally be reached on 6:30 a.m. to 3:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams can be reached on (703) 305-4705. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4900.

HEZRON WILLIAMS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

cdg
October 27, 2003